# Regulation and Risk: An Overview of Financial Issues

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## I. Background

Capital markets determine the terms and conditions under which funds are made available for infrastructure investments. The required returns to equity and bond investors determine a firm's cost of capital. Regulators need to understand the cost of capital because they can utilize estimates of capital costs to derive allowed returns. Even under price cap regimes, when a new cap is to be established, forward-looking capital costs will be taken into account for determining required cash flows. Hybrids of rate of return and price caps (such as earnings sharing and capital expenditure (CAPEX) regulation) also require the incorporation of capital costs.

The material presented here surveys the concepts and analytic techniques essential for understanding financial issues, including the determinants of the cost of capital. This paper outlines the causes and consequences of risk and the ways financial markets process information about risk and return.

## II. Role of the Cost of Capital in Decision-making

The global marketplace is a reality. Executives consider the benefits and costs of projects in various countries or jurisdictions. It is well understood that investors like returns but do not like risk. Thus, managerial decision-makers are faced with the task of quantifying expected returns and risks and communicating that information both to the capital markets and to the government agencies whose policies affect risks and returns. Underlying risks determine the cost of capital: the minimum rate of return that investors require to invest in a project or firm. Both equity owners and bondholders supply capital through global financial markets. The mix of capital determines the weighted average cost of capital, which then is used both by firms and regulators.

### A. Seven Questions Related to the Cost of Capital

Issues related to the cost of capital must be addressed by all businesses. In the case of capital-intensive infrastructure industries, regulators establish rules based on estimates of the cost of debt and equity. This section addresses seven questions:

*(1) How does the cost of capital affect regulators and infrastructure executives?*
*(2) How does the cost of capital influence how much a company will invest?*
*(3) How does the cost of capital affect price cap reviews and prices under price caps?*
*(4) How does the cost of capital impact prices under rate of return regulation?*
*(5) How do decisions by regulators affect the cost of capital?*
*(6) How do decisions by companies influence their cost of capital?*
*(7) How do regulators and infrastructure executives estimate the cost of capital?*

Each of these questions can be answered on several levels. The accompanying paper by Joel Houston, “A Survey of Financial Management," provides additional examples which will be useful for executives and regulators.

#### 1. How does the cost of capital affect regulators and infrastructure executives?

To set the stage, recall that bond markets bring together lenders (those with excess capital) and borrowers (those with a shortage of capital). The supply and demand of funds determines the underlying cost of debt capital. For example, the market rate for short term U. S. government debt (Treasury Bills) provides a starting point for U.S. investors who are estimating the cost of corporate debt, since the (nominal) market rate represents a real risk-free rate plus an inflation premium. Corporate bonds will have to offer a higher interest rate to compensate for higher risks. Potential investors are continuously processing information regarding the risks associated with different types

of investment in various countries. They will consider risks of inflation and potential default (and corporate bankruptcy) when selecting from among the vast array of financial instruments available to investors. Since equity capital is riskier still, it will be more expensive than a firm's cost of debt.

Global capital markets are impersonal. Regulators face public pressures for low prices. So higher costs of capital make it more difficult to achieve public acceptability. However, if firms are not given the opportunity to earn the cost of capital, investors will be unwilling to supply financial capital to the firm, jeopardizing continued expansion of capacity and/or the quality of service. Investors prefer to obtain high returns, but competition and regulation will both tend to drive the returns to levels commensurate with the risks. Executives of infrastructure firms assemble inputs, including capital, so increases in the cost of capital affects their choices regarding where (and whether) investments will be made.

A rate of return can be calculated by dividing some net income (profit) by the value of the assets which generate the profit. For example, we could calculate a rate of return on investment at book value or at market value. The valuation of infrastructure businesses and calculation of realized returns are complicated by the following. The value of a firm is determined by the present value of its net income. Regulators set the income by establishing an allowed (fair, or reasonable) rate of return to be earned on those assets. However, the realized rate of return has a numerator and denominator, and the latter depends on the value of the firm's assets. This circularity can be broken by fixing two of the three variables, but it illustrates the complex interrelationships among financial concepts. The rate of return calculation is further complicated by the fact that net income (accounting profit) is not the same as economic profit (which includes expected returns to equity capital as another cost that must be covered by the firm's revenues).

**2. How does the cost of capital affect how much a company will invest?**

Executives develop business plans based on the costs of inputs. As the cost of physical capital increases, there will be some substitution away from the relatively more expensive input. Less capital will be used to produce particular levels of output. In addition, in the capital budgeting process, projects will be ranked according to their expected returns (appropriately adjusted for risk). As the cost of capital increases, fewer potential projects will have returns that exceed the hurdle rate. Thus, a higher cost of capital reduces investments in new capacity, constrains projects for the delivery of new services, and causes substitution towards other inputs (raising overall production costs).

The primary financial objective of a firm is to maximize shareholder value. Firms face technological and commercial risks, so firms will choose capital structures to maximize shareholder value, given those risks. Over time, firms can influence the riskiness of their investments through the choice of projects and countries in which they invest. Contracts may not be honored, so the judicial system plays a role in determining expected returns. Regulatory rules may be changed, so the nature of the regulatory process takes on importance. In nations with no "track record" or minimal experience in regulatory matters, the uncertainties facing private investors will not be resolved for a number of years. As will be seen, that added risk will result in capital markets demanding higher returns to compensate investors for investing when the "rules of the game" are vague or subject to revision. If it turns out that commitments are met and outcomes are "best case" rather than "worst case," the realized returns will appear to be high.

However, at the time of the investment, perceived risks were real. Given a number of such situations, results in some countries will involve worst case outcomes. Thus, on average, investors will obtain the returns commensurate with anticipated risks. If regulators “claw back” those high returns but do nothing when realized returns are low, the asymmetric treatment will further raise the cost of capital. If financial markets expect a new regulatory body to behave in an asymmetric fashion, the initial cost of capital is higher than otherwise (reflecting the regulatory risk associated with expected lower returns). If suppliers of financial capital “believe” that the regulatory process will yield symmetric treatment, funds will be available at a lower cost.

Regulators have a number of public policy objectives. The chief financial objective of regulators is to provide investors the opportunity to earn a reasonable return on their invested funds. These "fair" returns ought to be high enough to maintain and attract capital into firms--while not allowing excessive returns. Let us define returns as excessive (or unreasonable) if they are unnecessary. We shall see that high risk projects require higher returns than low risk projects. So "excessive" does not mean "high," but higher than required by capital markets. As we shall see, returns also provide incentives for cost reduction and new service introduction. Reasonable people can disagree on

what "excessive" means in practice, but if returns are too low for the risks associated with the investments, that will be communicated to regulators by firms disinvesting in that country's infrastructure.

The objective of providing reasonable returns (or profits) may need to be balanced against other regulatory objectives, including public acceptability of regulatory decisions. Thus, some objectives can conflict with one another. However, other objectives can be enhanced by higher allowed returns. For example, a rapid pace of technological innovation and rapid infrastructure development may be enhanced by higher returns. Thus, while legitimacy to consumers is an important determinant of the sustainability of regulatory arrangements, credibility to investors is crucial if funds are going to be sunk into these capital intensive industries. Since today's customers are voters, utility prices draw the attention of politicians. Efficiency will not be promoted if below-cost pricing discourages investment and signals that consumers should buy large quantities of the service (at prices below cost). Such a pricing policy is a recipe for deterioration of service quality and disinvestment. The risk of administrative expropriation rises as regulatory discretion increases.

**3. How does the cost of capital affect price cap reviews and prices under price caps?**

The starting point for an initial price cap will be based on some estimate of production costs (including the cost of capital). If the price does not provide the firm with the opportunity to earn a reasonable (or fair) return on its investment, then it will not be viewed as compensatory--leading to disinvestment and/or quality-of-service deterioration (for example. reductions in reliability or long delays in installation). Experience with the price cap (including technological progress, input price changes, and other developments) provides some of the information used for a price cap review. Realized returns might be used for future modifications in the price cap formula. Thus, price cap regulation (in practice) has tended to retain some features of rate of return regulation--including disincentives to cost containment, since only a portion of cost savings is captured by the firm.

In the UK, the regulatory asset base (RAB) has sometimes been estimated by rolling forward an initial asset value--applying a market-to-asset ratio (MAR) to determine the new RAB for price cap review. This process becomes contentious, since the company may attribute a different value to those assets. Current cost accounting (CCA) may not yield the same RAB. A related issue is whether depreciation ought to be based on CCA.[1] In the US, asset valuation at original cost has tended to be by states in determining the rate base. However, depreciation practices and rate base disallowances are parallel sources of company/regulator disagreements.

**4. How does the cost of capital affect prices under rate of return regulation?**

Given the capital intensity of infrastructure firms, a high cost of capital will feed directly into high production costs. Under Rate of Return regulation, the price is built up from operating and capital costs. Information can be obtained through a number of mechanisms: hearings can be used to obtain testimony regarding actual and anticipated costs or documents can be submitted to the regulatory agency for evaluation. Thus, the estimated cost of capital is a key input determining the allowed (or "fair") rate of return. In conjunction with the rate base to which the allowed return is applied, the cost of capital is a significant determinant of the revenue requirements, and thus the price of the output.

Accounting procedures and regulatory decisions determine the rate base used in determining pnce--so regulators might allow a fair return and then disallow (from the rate base) assets that are not "used and useful." Capital markets interpret arbitrary (politically expedient) disallowances in a very negative way, so while the current (allowed) price might be low, the cost of capital will increase. The result is that future prices will be higher (or quality of service lower) than would otherwise be the case. This is just one example of the consequences of abusing regulatory discretion.

[1] See "Depreciation and Efficient Pricing," *Utility Finance*. OXERA March 1997 and "Determining the Regulatory Asset Base for Utility Price Regulation," *Utilities Policy*, March 1997. Vol. 6, No. 1.

**5. How do decisions by regulators affect the cost of capital?**

The regulatory environment, including the credibility of regulatory commitments, has a significant impact on the firm's cost of capital. Regulators need to have an understanding how the cost of capital is affected by decisions made over a number of years. These decisions can affect market structure (related to entry and vertical integration/disintegration), corporate behavior (price caps, reliability mandates, service standards, network modernization requirements), and industry performance (sharing rules that limit upside and/or downside returns, or penalties for missing regulatory targets). Regulators may be tempted to try to micromanage industries for which they have oversight responsibilities. However, they are unlikely to have comprehensive information regarding the feasibility of new technologies, opportunities for cost containment, or demand patterns for different customer classes.

Thus, "light-handed" regulation with an emphasis on incentives is replacing more detailed interventionist approaches to regulation. It is important to note, however, that regulatory tools developed for other purposes may affect the cost of or the returns to capital. Decisions can have an impact on investment even though those regulatory tools arose to meet problems that arose in a particular context (such as safeguards against the abuse of monopoly power). For example, mandated cost allocation rules are sometimes adopted for "fairness" in the sharing of overhead costs. Such rules can affect the prices for new services--and thus the expected returns from those services. So detailed cost allocation manuals can have negative consequences with respect to innovation. Arbitrary cost allocations can reduce returns to new investments and delay the introduction of new services.

Similarly, service deployment schedules that do not take additional costs and revenues into account can place financial strains on companies. Thus, regulatory tools developed for other purposes can affect both the cost of capital and subsequent investment decisions. Some tools that can reduce the unintended impacts of regulation include promoting competition where it is feasible, introducing price cap regulation, and practicing regulator forbearance. The net present value of cash flows determines the value of the firm. Asset valuation depends on the regulatory policies that constrain those cash flows. Thus, the value of the firm is determined by the allowed returns on investment and related (expected) regulatory policies. If future policies cannot be predicted with any degree of certainty, then (expected) future cash flows will be discounted at higher rates--reducing the value of potential investments and creating a disincentive to invest.

**6. How do decisions by companies affect their cost of capital?**

Companies influence their cost of capital through a number of channels. First, the choice of capital structure affects the cost of capital. From the standpoint of investors, providing equity capital is most risky, since owners are the residual claimants on company's net cash flows. Owners receive their returns through two channels: dividends and increases in the value of the firm's assets (reflected in the stock price appreciation). Bondholders obtain interest payments before dividends can be paid. One advantage to a highly leveraged firm is the discipline that it places on managers. It forces managers to go the capital market to obtain funds for new investments. Without cash flows, managers have less flexibility for making discretionary expenditures. Thus, they face the discipline of the capital markets. This pressure can improve operating performance--yielding higher returns than otherwise.

However, a highly leveraged firm depends more on debt for its overall financial capitalization, which increases the risk to both bondholders and stockholders. Both require higher returns to bear the risk, though the Weighted Average (Incremental) Cost of Capital (WACC) can be reduced up to point as leverage is increased from zero, since the cost of debt is less than the cost of equity. Thus, the firm's choice of degree of financial leverage (or gearing) affects its WACC (or overall cost of capital). The optimal financial structure minimizes its WACC. Given a firm’s expected cash flows, a minimized WACC maximizes the value of the firm (and its stock price).

As shall be seen, the cost of financial capital is influenced by a number of factors. The factors affecting Country Risk were noted above. Business risk is determined by (1) uncertainty about demand (unit sales), (2) uncertainty about output prices, (3) uncertainty about input costs, (4) potential product liability, and (5) degree of operating leverage. If a firm has a high proportion of fixed costs as a percentage of total costs, then a firm has high operating leverage. In such situations, a small decline in sales causes a large profit decline. This implies high business risk.

Investment risk has two components: business risk (assets' risks) and financial risk (risk from leverage-- the degree of debt financing). If the firm has high financial leverage (or gearing), debt servicing costs will be high--so that financial risk is magnified by the high business risk. Thus, the cost structure (such high fixed costs) has implications for the optimal capital structure. Both executives and regulators need to be aware of this feedback.

Similarly, the firm's own operating decisions influence its financial performance. In addition, its choice of projects affects the riskiness of its returns. To the extent that investors cannot diversify away those risks, the adoption of a risky investment plan increases the cost of capital, since investors will need to be compensated for the additional risk they are bearing. Risk is incorporated into the present value of an acquired asset (or a potential investment) through the risk-adjusted cost of capital. Risk will be evaluated in terms of earnings stability, the regulatory environment, potential product liability, accounting policies, degree of competition, and potential stranded investment.

The public acceptability of prices, quality of service, and access to the service all affect the political (and thus, regulatory) climate. Cost containment by companies ultimately gets reflected in lower prices--which improves the regulatory climate. Of course, cost containment that leads to high realized returns in the short run also affects public opinion. Similarly, high executive bonuses sometimes trigger public discontent with firms (and/or regulators). The efficiency of firms depends on the ability of investors to capture the benefits from good performance and on the firm's ability to reward key decision-makers. The sustainability of the regulatory process depends on the public acceptance of the outcomes with price patterns over time and across customer groups; these determine the legitimacy of the process in the eyes of citizens.

**7. How do regulators and infrastructure executives estimate the cost of capital?**

The weighted average cost of capital should be forward-looking for decision-making purposes. Executives compare the risk-adjusted cost of capital with expected rates of return for projects. As already been noted, debt and equity capital have different costs. So the cost of funds is the weighted average cost of capital (WACC, shown below). Since stockholders focus on after-tax returns, executives look at after-tax cash flows.

$$WACC = w_d k_d (l-T) + w_c k_c$$

Where $w_d$ and $w_c$ are the capital structure fractions for debt and equity, and $k_d$ and $k_c$ are the cost of debt and equity capital, respectively. High $w_d$ implies high leverage. There are disputes as to whether one should use market-based weights or book-based weights, or projected (target) weights for regulatory purposes. Targeted market weights are appropriate for executives' use for capital budgeting. The tax adjustment used here reflects the classical system comprising U.S. treatment of interest, where interest payments reduce taxable income--thus lowering the effective cost of debt capital. In the formula, T is the corporate income tax rate. Other systems give different treatment to profits and the interaction of personal and corporate taxes affects the cost of capital. Suffice it to note that the treatment of taxes (within and between countries) will affect the specific formulas used by decision-makers. We will not attempt to address these issues here.[2] $K_e = k_e \times (1\text{-ACT})/(1\text{-MCT})$

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Before considering the component costs of capital in greater detail, it is useful to focus on the determinants of risk since this is such an important topic for cost of capital.

[2] The UK uses an imputation system involving both the corporate tax rate and an imputation rate. The advance corporation tax (ACT) is 20% of the gross dividend payments. Under the imputation system, this ACT payment can be offset against their mainstream corporation income tax (MCT). Subsequently, investors obtain a tax credit, indicating that the tax already has been paid on the dividend. The pre-tax cost of equity can be calculated using the post-tax cost adjusted by the tax rates:

Where $K_e$ is the pre-tax cost and $k_e$ is the post-tax cost. Thus if ACT is 20% and MCT is 33%. The pre-tax cost of capital is 19% higher than the post-tax cost of equity. (See OXERA).

**B. Evaluating the Risks of International Investment**

The first principle of capital markets is *Never take a risk unless you receive adequate compensation for taking it.* Thus, from the perspective of international investors, whether providers of debt or equity capital, the assessment of risk is the first order of business.

**1. Investment Risk Equals Business Risk plus Financial Risk**

Business risk can be divided into Micro and Macro risks. Both are relevant in the context of international investment. Macro level risks include country risk. Country Risk is the additional risk incurred when lending to a foreign country, or to a borrower residing in a foreign country, or when making an equity investment in a foreign country, on top of the usual commercial risk in a domestic setting. Country Risk is composed of four different elements:

* *Macroeconomic Risk* is caused by indigenous or exogenous macroeconomic factors, such as poor crops, economic policies that cause high domestic demand, or a decline in prices for a country's exports, all of which adversely affect the balance of payments of a country, and thereby the availability of foreign exchange.

* *Political Risk* is caused by noneconomic factors that affect the availability of foreign exchange or the willingness of authorities to meet promptly their external obligations or to make available to the country's residents the foreign exchange needed to pay their obligations.

* *Transfer Risk* is the risk that a company which has the domestic currency required to service its debts or to pay its dividend may be prevented from paving by the inability to obtain or to transfer the foreign exchange needed to pay the external obligation.

* *Sovereign Risk* is the risk of subjecting a transaction to an additional jurisdiction--the borrower's or equity recipient's government. Changes in tax codes and ownership restrictions are two examples of sovereign risk.

The second type of business risk is associated with micro factors. Sometimes labeled Commercial Risk, this is the risk inherent in the underlying business. In addition to commercial (or business risk) associated with an investment, there is Financial Risk (related to the firm's own capital structure).

**2. Sources of Investor Information**

Investors obtain information on country risk from a number of sources. Euromoney magazine presents country risk ratings. Similarly, Political Risk Services (PRS), formerly Frost & Sullivan, provides monthly political risk indices relative to direct invest. PSR's monthly newsletter, *Political Risk Letter* contains forecasts of political risk in 85 countries. Reports on country risk also appear in the Institutional Investor magazine which provides country credit ratings. The *Economist* presents cross-country rankings as well. Such groups evaluate risk on the basis of historical experience and expectations regarding the future. Investors ask whether the country has the institutional foundations for designing and implementing an effective regulatory process. The legal system, cultural traditions, human resources, and information resources are four factors that affect institutional conditions.

Investors do not necessarily look for an "excessively" favorable investment climate, since such a situation may not be sustainable. Rather, they ask whether the regulatory process is fair to all parties and is consistent in its application. They seek countries with procedural transparency, that avoid arbitrary decisions, and that balance the needs of all stakeholder groups. Predictability is crucial, since future cash flows determine the value of potential projects. Uncertainty about those returns raises the risk premium required by investors. The key point is that investors seek an opportunity to earn a fair rate of return without exposure to *unnecessary* risk. Higher risks will require higher returns.

### 3. Fundamental Valuation Equation

For stock or bond valuation, it is necessary to discount future values.

(1) Estimate the future cash flows over the n periods under consideration.
(2) Determine the appropriate risk-adjusted discount rate, k.
(3) Find the value by discounting the expected cash flows.

In terms of a formula,

$$\textbf{Value} = \frac{CF_1}{(1+k)} + \frac{CF_2}{(1+k)^2} + \ldots + \frac{CF_n}{(1+k)^n}$$

k = investor's required return, which depends on the risk and general level of interest rates.

This fundamental equation is essential for financial analysis. This equation is very general, and applies to any type of asset: stocks, bonds, transmission lines, or a pension fund. In the above equation, in the case of stocks, the cash flows would be expected dividends. If the stock is sold at a future date, the terminal value of the stock becomes the last cash flow. Since that terminal value depends on further expected dividends, one method for estimating the required return on equity is the DCF (Discounted Cash Flow model, also labeled the Dividend Growth Model, DGM). In the case of bonds, the interest coupon payments represent the cash flows, and the terminal value is the repayment of the face value at maturity. The price (or value) of the bond depends on k, interest payments, and face value. While coupon payments are predictable, the price of the bond over time (its current value) will depend on the market rate of interest. If the market rate increases so that it exceeds the coupon rate, the market price of the bond will fall and become less than par value. The present value model can be applied to the valuation of other assets.

## III. Component Cost of Capital

Financial analysts are continually gathering data on regulatory decisions, corporate capabilities, and competitive conditions. They also carefully monitor the financial characteristics of firms, including their capital structures.

### A. Capital Structure

As has been noted there are two parts --cost of debt and cost of equity. The weighted average of the two is the cost of money. A company's debt-equity ratio tells how much of the company's assets are financed by debt versus how much is owned by the shareholders. For example, a 40/60 debt-equity ratio indicates that the company's long-term debt is equal to 40% of the value of its assets. The debt-equity ratio is also called the company's capital structure. In some jurisdictions, the capital structure is regulated. This can mean that the regulator controls the company's financing method or the regulator provides incentives for the company to develop an optimal capital structure.

### 1. Basic Calculation

In general, an optimal capital structure is one that minimizes the overall cost of capital. In many situations, shareholders may consider a high debt component to imply that the company has high risk. Also, a low debt component may mean that the company is relying too heavily on more costly equity to finance its operations. As with rate base, a representative time period must be chosen for the capital structure.[3] To illustrate a calculation:

[3] Mark Jamison provided material for this section.

| Type of Financing | Percent | Cost of Financing | Cost of Capital |
|---|---|---|---|
| Debt | 40% | 10% | 0.04 |
| Equity | 60% | 15% | 0.09 |
| | | | |
| Total | | | 13% |

**2. Double leverage**

The capital structure becomes complex when the utility is owned by another corporation or holding company that has its own debt. For example, a telephone utility may have a capital structure that is 40% debt and 60% equity. However, this equity is owned by an international holding company that has debt of its own -- for example, the holding company may have a capital structure of 20% debt and 80% equity. This holding company debt could be viewed as being used to own the equity of the telephone utility.

| Type of Financing | Percent | Cost of Financing | Cost of Capital |
|---|---|---|---|
| Debt | 40% | 10% | 0.04 |
| Equity | 60% | 15% | 0.09 |
| | | | |
| Total | | | 13% |

There are three ways of dealing with double leverage.

1. *Ignore it*. Companies generally propose this because double leverage lowers the allowed rate of return. The basic argument for ignoring the double leverage is that the holding company is just another investor. How the holding company gets its money should not be a factor in determining the fair return for the utility. Said another way, the regulator does not ask individual investors whether they borrowed the money to invest in the utility, so the regulator should also not ask the holding company.

2. *Use the holding company's cost of capital as the cost of the utility's equity*. For example, consider the following situation:

| Type of Financing | Percent | Cost of Financing | Cost of Capital |
|---|---|---|---|
| Holding Company Debt | 20% | 8.0% | 0.016 |
| Holding Company Equity | 80% | 15.0% | 0.12 |
| Total Holding Company | | | 13.6% |
| | | | |
| Utility Debt | 40% | 10.0% | 0.04 |
| Utility Equity | 60% | 13.6% | 0.0816 |
| | | | |
| Total Utility | | | 12.16% |

This method assumes that the real shareholders are the holding company's shareholders because they are the only source of outside equity capital. The holding company's use of debt is nothing more than a way to make the utility look as if it has less debt financing than it really has. This is the classic approach to double leverage.

3. *Use the entire system's consolidated and weighted cost of capital*. All of the holding company’s and subsidiaries equity and debt would be considered. This method assumes that the cost of capital is uniform throughout the holding company's system.

**B. Cost of Debt**

Bond ratings agencies regularly publish information on the riskiness of corporate bonds and government bonds from around the world. The evaluation process can be quite complicated. The five determinants noted above all affect the market interest rate. The cost of debt is relatively easy to determine w hen the bonds of the company are widely traded. The current (market) yield on outstanding debt is the cost of debt. For simplicity, we will focus on long term debt since investments are long-lived. The financing of current operations (such as inventories) could involve short-term debt. Short-term debt will generally be less costly than long term debt.

Corporate bonds would include a default risk premium, liquidity premium (reflecting the extent to which a financial instrument is widely traded), and a maturity risk premium (associated with being locked into a particular interest rate for a long duration). Thus, an individual U.S. firm's cost of debt will be greater than the market rate for U.S. government bonds. For simplicity we could denote the cost of debt as being comprised of several components:

$$k = k^* + IP + DRP + LP + MRP$$

where, k= Market Rate
k* = Real risk-free rate
IP = Inflation Premium
DRP= Default risk premium
LP = Liquidity premium
MRP= Maturity Risk Premium

In the case of the U.S., the real risk-free rate plus the expected rate of inflation (IP) is captured by the market rate on 30 day Treasury Bills. Provisions in the bond contract affect default risk: is it secured or unsecured debt? senior or subordinated? possessing guarantee provisions? sinking fund provisions? All these factors affect the DRP portion of the risk facing bond purchasers. If the issuer defaults, bond investors receive less than the promised return. Thus, investors will consider the financial indicators of a firm when evaluating risk. If the bond is widely traded the liquidity premium (LP) will be low. Bonds with more years before the principal is must be repaid will tend to have a MRP (maturity risk premium).

The yield curve depicts the cost of debt (interest rate) as a function of the debt's maturity (one, five, or twenty years). The curve tends to be upward sloping, indicating a lender preference for short-term debt since it is less sky. However, locking into a fixed interest rate for a long period of time can reduce the risk associated with possible increases in short term rates. Thus, inflationary expectations affect the shape of the yield curve.

A variety of debt instruments exist. Bank loans are debt. Bonds represent debt: these can be straight or convertible, index linked, or private placements (closely held and not widely traded). Even leases represent debt, Thus, when calculating the $k_d$ the type of debt needs to be identified.

Under rate of return regulation in the U.S., regulators have tended to use an embedded cost of debt rather than the forward-looking cost of debt for calculating the cost of debt. Returns tended to be based on the historical (or embedded) rate base. Firms were given the opportunity to earn returns which allowed them to make their interest payments--so they would not be affected by changes in the interest rate.

In the U.S., the cost of debt for regulatory purposes is generally the embedded cost of outstanding long term debt. It is a weighted average of all long term debt, For example:

| Vintage | Embedded Cost of Debt | Share of All Debt | Weighted Cost of Debt |
|---|---|---|---|
| 1990 | 7% | 40% | 0.028 |
| 1981 | 12% | 60% | 0.072 |
| Total | | | 10% |

Of course, for business decision-making, this number is irrelevant. High past inflation that resulted in high historical interest rates should not have an impact on WACC, which would be used for investment purposes. If the 1981 bonds are coming due next year, the forward-looking interest is the one relevant for financial decision-making. In the context of regulation, use of embedded interest rates can result in inappropriate price signals, since the capacity component of cost will not reflect forward-looking opportunity costs.

**C. Cost of Equity**

The cost of equity is the shareholders' expected returns. Most people use the term "profit" to describe return on equity. However, because the company has to pay something to shareholders in order to be able to continue to use their capital, at least some portion of this “profit” is a cost to the firm. Indeed if the returns that shareholders expect are greater than the company's actual return on equity, then the investors are losing money. This can create some confusion because there are two fundamental definitions of the word "profit."

*Normal person definition* -- In normal business usage, profit is revenues minus explicit costs. Explicit costs are out-of-pocket costs such as wages, utility expenses, interest, and rent.

*Economist definition* --Profits over and above a normal level. In economics, a normal level of profit is considered a cost of obtaining money from shareholders. Normal profits are an opportunity cost to shareholders because shareholders give up getting normal profits somewhere else in order to invest in this company.

Opportunity costs represent money that a company or person gives up, whether they ever physically had the money or not. Opportunity costs include explicit costs plus, for example, money a company could have made by producing services that have higher value. When shareholders provide capital to a company, they give up the opportunity to earn normal profits from other businesses. Economics considers these foregone profits to be a shareholder cost.

Stockholders own the company and assume the residual risks. They realize that this return is not fixed or guaranteed. Estimates of the cost of equity capital can be obtained using several methodologies. Methods of estimating the cost of equity include discounted cash flow, comparable earnings, P/E ratios, risk premium, and capital asset pricing.

**1. Discounted Cash Flow (DCF)**

*Discounted cash flow* (DCF) is traditionally the most popular method. It assumes that the market price of the stock is the present value of the future benefits of owning the stock, including dividends and thc ultimate sale of the stock. The basic formula is $k = D_1/P_0 + g$

Where:

| | |
|---|---|
| k | is the required or expected return on equity capital |
| $D_1$ | is the dividend to be received at the end of the first year |
| $P_0$ | is the current market price |
| g | is the constant expected annual rate of growth in dividends per share |

g is generally determined by historical growth, analysts’ forecasts of growth rates, and/or sustainable growth or retention growth.

Historical growth is generally based on dividend or earnings growth over 5-10 years. Whereas sustainable growth is determined by multiplying retained earnings by the company's rate of return on book equity (g = b x ROE). This method is accurate only if rate of return is constant over time, the retention rate is constant over time, and the company sells any new common equity at book value. These assumptions rarely hold. For example, the issuance of new equity stock involves floatation costs.

**2. Comparable Earnings**

*Comparable earnings* tries to estimate earnings for comparable companies that have similar risks, etc. The basic assumption is that these earnings represent the shareholders' opportunity costs. Of course, the analyses become circular if the comparable companies are utilities whose earnings are also being regulated.

**3. P/E Ratio Method (Price/Earnings)**

*The P/E ratio method* attempts to align the market price of the stock with its book value. In other words, it attempts to make the market value equal to the book value of the stock. For example, if a company has earnings per share of $3.50, a market price of $30, and a book value of $25, the allowed rate of return would be $3.50/$30 = 11.6%. However, if the firm is operating in regulated and unregulated markets, this would be quite inappropriate. The market value of most competitive firms can be two to three times the book value of its assets. Great care should be taken in applying this method to calculating the cost of equity capital.

**4. Own Bond Yield Plus Risk Premium Approach (RP)**

The risk premium approach compares the realized yields on long term utility bonds to returns on the common stock (dividends plus stock price appreciation) of companies with similar debt ratings. The underlying assumption is that equity capital requires a predictable premium over the cost of debt. In the US, the risk premium has ranged from three to five percentage points above the firm s own cost of debt. Of course, historical relationships need not apply if there are fundamental changes in economic conditions.

**5. Capital Asset Pricing Method (CAPM)**

The capital asset pricing method (CAPM) is similar to the risk premium approach in that analyzes the extra risk involved in owning equity versus debt. In this method, the debt examined is “risk free” debt such as US treasury bills. The cost of common equity equation resembles the equation for bonds shown earlier, except the risk premium reflects the stock's inherent (nondiversifiable) risk:

$$k_s = k_{RF} + (k_M - k_{RF})\beta$$

where $k_s$ is the CAPM estimate of the cost of equity capital,
$k_{RF}$ is the risk free rate (Treasury Bills or Treasury Bonds)
$k_M$ is the expected return on the "market" (entire portfolio)
$\exists$ is the company “beta”

A beta can be estimated by statistical analysis, regressing the firm’s own equity returns against the return on "the market" (or a well diversified portfolio). The beta coefficient indicates how risky a stock is relative to an 'average stock.' If beta is 1.0, then it is the average stock if it is less than 1.0, the stock is less risky than average. In the US, most stocks have betas in the range of 0.5 to 1.5. Electric utilities in the US have betas ranging from 0.5 to 0.7. The betas for telecommunications firms have risen over the past decade as competitive pressures and uncertainties associated with deregulation have affected corporate returns.

The expected return on the US market has been estimated at about 15%, so if the risk free rate were 5% and the beta is 0. 7, the estimated cost of capital would be k = 5% + (15% - 5%) (0. 7) = 12%. Financial analysts make estimates of firms’ betas, using historical data and forecasts of future developments. The estimation process is not rocket science." There are many legitimate disagreements over the various components of the CAPM model. In the context of an economy or firm with little historical data, the CAPM provides a conceptual framework for placing some bounds on the cost of equity capital--but comparables must be obtained from other countries in similar situations. Multi-factor betas have been proposed as a refinement of this approach to estimating $k_s$.

The bottom line is that this area involves judgement calls. However, as noted earlier, capital markets are large and impersonal: the cost of equity capital is not an arbitrary number, but precise calculation can be elusive. All participants in the regulatory process need to develop analytic frameworks that can place reasonable bounds on this important number.

**IV. Other Sources of Risk for the Firm: Managers vs. Investors**

There is always a residual claimant or risk-bearer. Equity owners bear the greatest risk. Alternatively, taxpayers can be forced to bear risk through public ownership, social protection policies, project guarantees, or subsidized

programs. However, risk is real, it does not disappear; but can be transferred. This section shows how infrastructure projects in developing countries may face greater underlying risks due to an uncertain policy environment, macroeconomic instability, insecure property rights, relatively long gestation periods for products, and uncertainty regarding prospects for local market growth.

There are substantial information asymmetries in new investment settings. Costs of acquiring information about local conditions are high. In addition, many countries have only minimal disclosure standards or accounting rules. This makes it difficult for credit rating agencies to evaluate the economic fundamentals of a project. Finally, project promoters may lack experience in such large-scale projects--so potential investors have insufficient evidence on ability to perform.

In a presentation to the World Bank/IFC Workshop on Advanced Topics in Private Participation in Infrastructure (September 1996), Ignacio Mas outlined issues which make it difficult for owner/shareholders to provide incentives to managers for cost control. Exercising control over managers is difficult because the owner (principal) does not know whether poor outcomes are due to events beyond the manager's (or agent's) control or to poor management. Mas identified a number of problems with infrastructure projects that increase risks to investors or that complicate the decision-process.

*** Timing of cash-flows.**
The bulk of investments are required up-front with payback spread over a long time. Large cash outflows are required for what could be a prolonged construction period. Delays can arise as environmental issues halt projects or politically powerful incumbents introduce new legal barriers. If regulatory rules change during the life of the project, the realized returns will differ from predicted returns. Even without undue delays. Back-end loading of returns increases the project's risk. On the other hand, large indivisibilities in investments often imply excess capacity in the early years of the project's operation. So efficient price signals call for relatively low usage prices--to better utilize the capacity and bring price closer to economic opportunity costs. However, higher monthly fees via multipart pricing can generate greater cash flows in early operating periods, while still keeping marginal price low. Understanding the interaction among investment planning, project financing, and rate design (price structure) is crucial for both regulators and executives.

*** Project size relative to local capital markets.**
A smaller percentage of financing can be expected to come from "inside" equity investors. This means that external investors (who have less information regarding local opportunities) have much at risk. In addition, from the perspective of the host country, foreign capital flows can be perceived as destabilizing the external balance. To some extent, such flows are reversible and therefore unreliable. For countries without a substantial history of external private participation, large infusions of external funds often are accompanied by contingent government liabilities (via guarantees). In addition, since infrastructure revenues will be in local currency, foreign exchange debt financing tends to require indexation of service prices and convertibility support.

*** Local participation in the project can reduce project risk.**
A larger share of local investment may imply higher domestic savings--improving the external balance. Local participation greatly reduces the political sensitivity of high realized returns. For example, stock ownership by domestic pension funds broadens the political support for keeping regulatory commitments.

*** Public/private nature of the project.**
Implicit contracts with suppliers, communities, and bureaucrats/politicians tend to entrench management practices. Cozy relationships make cost-containment more difficult--reducing potential returns to equity investors.

*** Lack of market discipline.**
Less competitive product and factor markets reduce pressures on management performance. Such situations may provide opportunities for returns, but local management can improve its situation at the expense of investors. In addition, bond-holders and equity owners can have conflicting objectives that management can exploit. Debt returns are truncated upwards—bond-holders will (at most) receive the coupon interest payments plus the principal when the bond matures. Equity returns are truncated downwards but have tremendous upside potential. This difference in patterns of returns combined with asymmetric information leads to a principal-agent problem.

The debt/equity agency problem has two features. There is an *adverse selection problem* to the extent that entrepreneurs promoting a very risky project are more likely to outbid others in the credit markets to the extent that credit rating agencies cannot identify the project as having high risk. Second, because it is difficult to monitor project promoters, those borrowers have an incentive to take on greater risk if the market for debt is unable to penalize them (through higher required interest rates). Imperfect monitoring (resulting in such a *moral hazard*) is a potentially significant problem where the aspiring promoters do not have a track record. Of course, entrepreneurial groups will get bad reputations if they exploit these information asymmetries. Bond covenants and asset-backed loans are ways of partly addressing these problems.

*** Regulation.**
Managerial performance becomes inextricably linked to regulatory actions: regulatory barriers to hostile takeovers and lengthy approvals for acquisitions protect managers from overthrow. In addition, in a monopoly setting, it is difficult to benchmark performance, since no other firms face similar circumstances. However, when regulation is comprehensive (involving significant micromanagement), government becomes better informed--reducing the difficulties associated with expropriation or partial take-overs. So regulation complicates how financial markets evaluate the expected risks and returns of firms.

*** Monopolization of technical skills.**
Industry-specific knowledge is vested in current managers, making them harder to replace. For the sake of job security, managers might be excessively risk averse and they could delay reporting potential problems--hoping that prospects will improve. Their control of information increases their bargaining position relative to stockholders (as represented by the Board of Directors). Strong governance structures can strengthen the oversight capabilities of equity owners. Manager-held equity (or compensation based on stock performance) can align incentives of owners and managers.

Also contributing to the political risks of infrastructure investments is that fact that recent innovations tend to be embedded in the firm's assets, reducing the need for ongoing infusions of technology. When the assets (such as buried pipes) are highly specific to the locale and have a low salvage value, dependence on ongoing links to the initial capital providers is reduced (unless there is an ongoing need to raise external capital).

For all the above reasons, investors will require higher returns to compensate for risks associated with infrastructure projects. National governments can take several initiatives to address some of the informational issues noted above. However, it is not clear that government agencies can really provide efficient screening of projects or monitor their implementation. Politics and incentives to "promote" projects reduce the credibility of government agency studies. When someone else's funds are at risk, incentives are diminished for gathering and reporting all the relevant information.

Another rationale for government involvement is risk-based. Some view government as able to bear risks more efficiently than private markets. In the case of diversifiable risk does a government have more opportunities for diversification? Given that the capital markets are global and that an individual nation's welfare is tied to its own macroeconomic performance--its ability to fully diversify is questionable. Outcomes of state guarantees are likely to be highly correlated.

Firm (or project)-specific risk is reflected in its beta, so bearing systematic risk might be handled through the government effectively creating a giant mutual fund of projects. Liabilities associated with the projects would be spread over the entire taxpayer base. However, the allocation of such risk involves administrative processes that are fundamentally political in nature. Experience suggests that private participation avoids some of the political issues that arise with government raising funds and directing investment programs.

## V. Implications for Utilities Today

Operating managers throughout the world are aware of the dramatic changes in their industries. Technological changes, institutional changes, and private participation in infrastructure are altering the landscape. Many managers and executives are used to making financial and operating decisions in a protected and very predictable environment. For some nations, political patronage was a significant determinant of the size and skill mix of the service supplier's labor force. Past practices may be far from "best practice;" executives need to rethink their ways of

doing business. Senior managers gained experience in a "traditional" utility setting. In the case of publicly-owned firms, financial returns were not always the major determinant of investment decisions. Even firms that were attempting to maximize shareholder value often had a monopoly position, leading to particular ways for project evaluation and capital budgeting. The electric utility industry illustrates this point. The company's primary responsibility was to provide reliable power on demand. Therefore, future demand was estimated, the engineers determined what assets would be needed to meet that demand, and the accountants worked with the engineers to determine the "costs" of alternative ways to meet demand. Then, the present value of future costs under the alternative systems were determined and the system that provided the "required" power at the lowest present value of costs was chosen. Note that some of these accounting costs (such as depreciation) did not track economic costs.

In addition, dollar revenues did not enter the equation--unit sales were forecasted but not dollar sales. In the U.S., it was assumed that regulatory commissions would permit the company to raise rates if a price increase was necessary to produce a fair rate of return on the invested capital. In the case of government ownership, the Treasury was the residual supplier (and recipient) of funds, but for many countries, unsatisfactory industry performance has lead to restructuring, private participation, and/or privatization.

In the monopoly days, rate design issues (such as peak load pricing) and demand elasticities were often ignored and uniform (postage stamp) pricing tended to be utilized so customers in high density and low density areas paid the same price--despite different costs of service. Price was determined from the bottom up, with politically acceptable cost allocations determining the beneficiaries of scale economies. Such allocations also implicitly determined who would be burdened by unsuccessful projects. In the U.S. the introduction of competition has revealed "stranded costs"--or investments that have proved to be uneconomic. Due to technological change or historical construction cost overruns, the book value of assets is greater than the market value (based on the net cash flows that can be generated from these assets under likely competitive scenarios). Similarly, in other countries, privatization has resulted in some assets selling at far less than book value--since economic value depends on alternatives that customers face today. Competition implies that prices are not determined by administrative procedures, and that capacity costs (based on historical outlays and accounting depreciation) are not necessarily recovered.

Today, infrastructure firms must consider revenues directly Rather than building plants, determining the "required" profits, and adding up components of costs to obtain "revenue requirements," they must reverse the procedure. Now managers must estimate quantity demanded and price simultaneously, then estimate operating costs and the resulting profits and cash flows, then determine the rate of return on investment (or the net present value of the project), and finally, decide to invest or not depending on the project's forecasted profitability.

The same kinds of lessons could be drawn from telecommunications, natural gas, and the water industries. Technological innovations, dramatic input price changes, new environmental regulations and other developments have created new opportunities for infrastructure firms and placed new constraints on their activities. Many of the associated services are extremely capital intensive, and projected cash flows depend on regulatory rules that will be in effect over the life of the project. Both government ownership and monopoly regulation of a vertically integrated firm led to industry practices that are totally inappropriate for an era when competition is being introduced into infrastructure industries. Although managers are well aware of the changing situation and are beginning to think like decision-makers in a competitive, unregulated firm, most senior executives were trained in the traditional utility mode. Thus, this material (and the accompanying paper by Houston) attempts to underscore the key lessons in financial management that need to be learned by senior managers

## VI. Concluding Observations

The topics covered here all relate to financial markets and the Time Value of Money. Firms base their investment decisions on the net present value of projects--so that net cash flows over the life of the project must be large enough to justify the investment. The riskiness of a project (or an entire firm) affects its net present value through the discount rate used to value future cash flows. High-risk environments will require that a higher cost of capital be used to evaluate projects. The required returns are greater in situations with higher risk.

The cost of capital is an important variable in the regulatory process. Under Rate of Return (RoR) Regulation, it is used to derive the appropriate annual costs for the firm's assets Under Price Cap Regulation. WACC is used for setting initial caps and in rate reviews. Much controversy surrounds the calculation of the required return on equity

investment--one of the components in the overall cost of capital. In addition, a number of accounting issues need to be addressed in the regulatory process. These relate to the valuation of assets, depreciation practices, funding of pension plans, and treatment of particular expenditures (such as mandated demand side management programs or outlays for meeting unique social obligations). Both regulators and infrastructure managers need to understand the factors determining the cost of capital.

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